

REMARKS

Claims 2-4, 6, 8-41 and 43-50 are pending in this application. By this Amendment, claims 2, 6, 8-10, 17, 23, 25-30, 36, 38, 40, 43, 47 and 48 are amended, claims 1, 5, 7 and 42 are canceled, and new claims 49 and 50 are added. No new matter has been added. Reconsideration in view of the foregoing amendments and following remarks is respectfully requested.

The attached Appendix includes marked-up copies of each rewritten paragraph (37 C.F.R. §1.121(b)(1)(iii)) and claim (37 C.F.R. §1.121(c)(1)(ii)).

Applicant appreciates the Office Action's indication that claims 25, 26 and 34-42 contain allowable subject matter. However, for the reasons set forth below, Applicant submits that all of claims 2-4, 6, 8-41 and 43-50 contain patentable subject matter.

I. Formal Matters

The Office Action objects to the drawings for failing to show the feature "expanded portion" specified in the claims. Applicant respectfully submits that the expanded portion in claim 26 corresponds to the rear end portion 12a (2) in Fig. 19. Thus, the specified claim feature "expanded portion" is shown in the drawing figures. Furthermore, Applicant has amended page 35 of his specification to replace "wide portion" with "expanded portion" to be consistent with the original claim language. Therefore, Applicant respectfully requests that the objection to the drawings be withdrawn.

The Office Action objects to claims 1, 6, 17, 27 and 28 due to minor informalities. Regarding claims 6, 17, 27 and 28 Applicant respectfully submits that by this amendment, they are amended responsive to the stated grounds of objection. Regarding claim 1, the subject matter of which is now amended into claim 25, Applicant respectfully submits that it is also amended to correct the stated informalities. Therefore, Applicant respectfully requests that all objections to the claims be withdrawn.

The Office Action rejects claim 26 under 35 U.S.C. §112, first paragraph. Specifically, the Office Action states that "expanded portion" is not sufficiently described by the specification and drawings. As discussed above, in the response to the objection to the drawing figures, Applicant respectfully submits that "expanded portion" refers to element 12a(2) as illustrated in Fig. 19. Furthermore, page 35, line 11 of the specification has been amended to replace "wide portion" with "expanded portion". Therefore, Applicant submits that "expanded portion" is sufficiently described by the specification and represented in the drawing figures. Accordingly, Applicant respectfully requests that the rejection of claim 26 under 35 U.S.C. §112, first paragraph, be withdrawn.

The Office Action rejects claims 25, 26, 36, 38 and 40 under 35 U.S.C. §112, second paragraph. Specifically, the Office Action states that the phrase "wherein the case" renders the claims indefinite. Therefore, Applicant has amended claims 25, 26, 36, 38 and 42 to remove this phrase. Claim 26 is additionally rejected because of its recitation "expanded portion." As discussed above in the response to the objection to the drawings and the rejection of claim 26 under 35 U.S.C. §112, first paragraph, Applicant respectfully submits that the description and location of the feature "expanded portion" is clear and can be determined from the specification. Therefore, Applicant respectfully requests that the rejection of claims 25, 26, 36, 38 and 40 under 35 U.S.C. §112, second paragraph, be withdrawn.

The Office Action rejects claim 42 under 35 U.S.C. §112, second paragraph. Applicant respectfully submits that the rejection has been rendered moot by the cancellation of claim 42.

## II. Claims Define Patentable Subject Matter

The Office Action rejects claims 1-8, 10-13, 20-24, 27-33, 43, 47 and 48 under 35 U.S.C. §103(a) as unpatentable over U.S. Patent No. 4,791,719 to Kobayashi et al. in view of

U.S. Patent No. 6,329,211 to Terunuma et al.; rejects claim 9 under 35 U.S.C. §103(a) as unpatentable over Kobayashi et al. in view of Terunuma et al. and further in view of U.S. Patent No. 6,183,656 to Ide et al.; rejects claims 14-19 under 35 U.S.C. §103(a) as unpatentable over Kobayashi et al. and Terunuma and further in view of U.S. Patent No. 6,303,392 to Matsukuma; and rejects claims 44-46 under 35 U.S.C. §103(a) as unpatentable over Kobayashi and Terunuma and further in view of JP 11-312303 to Sasaki and U.S. Patent No. 6,072,671 to Gill. Applicant respectfully traverses the rejections.

Applicant respectfully submits that objected to claim 25 has been amended to incorporate the subject matter of original claim 1 and further to correct all claim objections and rejections under 35 U.S.C. §112. As admitted by the Office Action, in the statement for the reasons for indication of allowable subject matter, the prior art of record entirely fails to show or render the second magnetic layer portion which covers an area of the thin film coil and is magnetically coupled to the first magnetic layer portion. Therefore, Applicant respectfully submits that claim 25 is patentable over the references of record. Dependent claims 2-4, 9-24, 26-41 and 43-48 have been amended to depend upon claim 25 and are likewise allowable. New independent claims 49 and 50 also include the allowable subject matter indicated by the Office Action and are thus allowable for at least the same reason as amended claim 25. Accordingly, Applicant respectfully requests that all outstanding rejections of the claims under 35 U.S.C. §103(a) be withdrawn.

In view of the foregoing amendments and remarks, Applicant submits that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 2-4, 6, 8-41 and 43-50 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicant's undersigned representative at the telephone number set forth below.

Respectfully submitted,



James A. Oliff  
Registration No. 27,075

Phillip D. Mancini  
Registration No. 46,743

JAO:PDM/can

Attachment:  
Appendix

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**OLIFF & BERRIDGE, PLC**  
**P.O. Box 19928**  
**Alexandria, Virginia 22320**  
**Telephone: (703) 836-6400**

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## Changes to Specification:

Page 34, line 15 to page 35, line 12:

By selectively etching and patterning the top pole tip precursor layer 112a by RIE with the first mask 22a, as shown in Figs. 7A and 7B and Fig. 16, the top pole tip 12a made of iron nitride is selectively formed in a part of the area on the write gap layer 11 and a part of the area on the insulating film pattern 10. By the etching process, the area (except for the portion which becomes the magnetic path connection portion 12b) other than the area of forming the first mask 22a in the top pole tip precursor layer 112a (which is not shown in Figs. 7A and 7B and Fig. 16) is selectively removed. At the time of forming the top pole tip 12a, simultaneously, the another mask 22b is used and the magnetic path connection portion 12b (not shown in Fig. 16) is formed in the opening 10k. The top pole tip 12a and the magnetic path connection portion 12b construct a part of the top pole 12. The top pole tip 12a has a plane shape as shown in Fig. 19 which will be described hereinlater, and includes a front end portion 12a(1) having an uniform width which specifies the recording track width on a recording medium (not shown) and a rear end portion 12a(2) having a width wider than that of the front end portion 12a(1). The top pole tip 12a corresponds to an example of a "first magnetic layer portion" in the invention, the front end portion 12a(1) corresponds to an example of a "first magnetic pole" in the invention, and the rear end portion 12a(2) corresponds to an example of a "~~wide expanded~~ portion" in the invention.

## Changes to Claims:

Claims 1, 5, 7 and 42 are canceled.

Claims 49 and 50 are added.

The following is a marked-up version of the amended claims:

2. (Amended) A method of manufacturing a thin film magnetic head according to claim ~~425~~, wherein an irradiation angle of an ion beam is changed at least once during the first etching step.

6. (Amended) A method of manufacturing a thin film magnetic head according to claim ~~549~~, wherein in the first etching step, an ion beam is irradiated from a direction at an angle plus or minus 15 degrees of 75 degrees in the width direction, the angle being defined as an angle between the direction of the ion beam and a direction orthogonal to an extending direction of the magnetic material layer.

8. (Amended) A method of manufacturing a thin film magnetic head according to claim ~~750~~, wherein in the first etching step, an ion beam is irradiated from a direction at an angle plus or minus 15 degrees of 45 degrees in the width direction, the angle being defined as an angle between the direction of the ion beam and a direction orthogonal to an extending direction of the magnetic layer.

9. (Amended) A method of manufacturing a thin film magnetic head according to claim ~~425~~, further comprising a step of polishing the surface of the magnetic material layer so as to planarize the surface thereof between the step of forming the magnetic material layer and the step of forming the mask precursor pattern.

10. (Amended) A method of manufacturing a thin film magnetic head according to claim ~~425~~, wherein a step of forming the mask precursor pattern includes:

a step of forming a mask precursor layer on the magnetic layer; and

a third etching step of forming the mask precursor pattern by selectively etching the mask precursor layer by reactive ion etching.

17. (Amended) A method of manufacturing a thin film magnetic head according to claim 13, wherein either ~~ion-iron~~ nitride or cobalt iron is used as a material of the metal film pattern.

23. (Amended) A method of manufacturing a thin film magnetic head according to claim 125, wherein a predetermined inorganic material is used as a material of the first mask.

25. (Amended) A method of manufacturing a thin film magnetic head according to claim 1 including first and second magnetic layers magnetically coupled to each other and having first and second magnetic poles which face each other, with a gap layer in between, in a recording-medium-facing surface to be faced with a recording medium, a thin film coil provided between the two magnetic layers, and an insulating layer for insulating the thin film coil from the two magnetic layers,

wherein at least one step of forming the first magnetic pole and a step of forming the second magnetic pole includes:

a step of forming a magnetic material layer;

a step of forming a mask precursor pattern on the magnetic material layer;

a first etching step of forming a first mask by narrowing a part of the mask precursor pattern by ion beam etching and, simultaneously, etching the magnetic material layer to a depth in an area other than an area where the first mask is formed; and

a second etching step of forming at least one of the first and second magnetic poles by selectively etching the magnetic material layer by reactive ion etching with the first mask, wherein in the case where the first magnetic pole extends in a direction apart from the recording-medium-facing surface and defines a recording track width of the recording medium, and the first magnetic layer includes a first magnetic layer portion having the first magnetic pole and a second magnetic layer portion which covers an area of the thin film coil and is magnetically coupled to the first magnetic layer portion,

the first mask is formed so that a plane shape thereof includes at least a portion corresponding to the first magnetic pole in the first magnetic layer portion.

26. (Amended) A method of manufacturing a thin film magnetic head according to claim 25, ~~wherein in the case~~ where the first magnetic layer portion further includes an expanded portion which is magnetically coupled to the first magnetic pole on the side far from the recording medium facing surface and is wider than the first magnetic pole, a step in the width direction is formed in a position where the first magnetic pole and the expanded portion are coupled to each other, and a corner is formed at a part where a side face of the first magnetic pole and a step face of the expanded portion in the step cross each other, the first mask is formed so that the plane shape thereof includes a part corresponding to a plane shape of the expanded portion, and an angle at a part corresponding to the corner of the first magnetic layer portion lies in a range from 90 degrees to 120 degrees.

27. (Amended) A method of manufacturing a thin film magnetic head according to claim ~~1~~10, wherein in the third etching step, an etching process is performed in a gas atmosphere containing at least one of chlorine, boron trichloride, hydrogen chloride, carbon tetrafluoride, sulfur hexafluoride, and boron tribromide.

28. (Amended) A method of manufacturing a thin film magnetic head according to claim ~~1~~10, wherein in the third etching step, an etching process is performed at a temperature in a range from 50 degrees to 300 degrees.

29. (Amended) A method of manufacturing a thin film magnetic head according to claim ~~1~~25, wherein in the second etching step, at least the first magnetic pole in the first magnetic layer is formed.

30. (Amended) A method of manufacturing a thin film magnetic head according to claim ~~1~~25, wherein in the second etching step, at least the second magnetic pole in the second magnetic layer is formed.



36. (Amended) A method of manufacturing a thin film magnetic head according to claim 34, ~~wherein in the case~~ where the thin film coil ~~portion~~ has a first thin film coil layer pattern and the insulating layer has a first insulating layer portion which buries at least the first thin film coil layer pattern, the method comprises:

a step of forming the first insulating layer portion so as to cover at least the first magnetic layer portion and the first thin film coil layer pattern; and

a step of forming a first planarized face by polishing a surface of the first insulating layer portion until at least the first magnetic layer portion is exposed.

38. (Amended) A method of manufacturing a thin film magnetic head according to claim 36, ~~wherein in the case~~ where the first magnetic layer includes a third magnetic layer portion between the first and second magnetic layer portions, the third magnetic portion magnetically coupling the first magnetic layer portion and the second magnetic layer portion

the third magnetic layer portion is patterned on the first planarized face by reactive ion etching.

40. (Amended) A method of manufacturing a thin film magnetic head according to claim 38, ~~wherein in the case~~ where the thin film coil ~~portion~~ further has a second thin film coil layer pattern disposed in a layer different from the first thin film coil layer pattern, and the insulating layer further has a second insulating layer portion for burying at least the second thin film coil layer pattern, the method comprises:

a step of forming the second thin film coil layer pattern on the first planarized face and forming a first connection pattern serving as a part of the thin film coil ~~portion~~ integrally with the second thin film coil layer pattern at an end;

a step of forming the third magnetic layer portion and forming a second connection pattern on the first connection pattern, the second connection pattern serving as a part of the thin film coil ~~portion~~;

a step of forming the second insulating layer portion so as to cover at least the third magnetic layer portion, the second thin film coil layer pattern, and the second connection pattern;

a step of forming a second planarized face by polishing a surface of the second insulating layer portion until at least both of the third insulating layer portion and the second connection pattern are exposed; and

a step of forming a conductive layer pattern so as to be electrically connected to an exposed face of the second connection pattern on the second planarized face.

43.     (Amended) A method of manufacturing a thin film magnetic head according to claim ~~1~~25, wherein the magnetic material layer is deposited by sputtering with a predetermined magnetic material.

47.     (Amended) A method of manufacturing a thin film magnetic head according to claim ~~1~~25, wherein in the second etching step, an etching process is performed in a gas atmosphere containing at least one of chlorine, boron trichloride, and hydrogen chloride.

48.     (Amended) A method of manufacturing a thin film magnetic head according to claim ~~1~~25, wherein in the second etching step, an etching process is performed at a temperature in a range from 50 degrees to 300 degrees.